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C.P. Kelkar

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* C.P. KELKAR,  
DAVID M. STOCKWELL, and SAMUEL J. TAUSTER

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Appeal 2009-006176  
Application 10/763,812  
Technology Center 1700

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Before CHUNG K. PAK, CHARLES F. WARREN, and  
TERRY J. OWENS, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 17-23 and 25-29 in the Office Action mailed April 15, 2008. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R.

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<sup>1</sup> The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the “MAIL DATE” (paper delivery mode) or the “NOTIFICATION DATE” (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

§ 41.31(a) (2008).

We affirm the decision of the Primary Examiner.

Claim 17 illustrates Appellants' invention of a method of reducing NO<sub>x</sub> emissions during fluid catalytic cracking [FCC] of a hydrocarbon feedstock into lower molecular weight components in the presence of a NO<sub>x</sub> reduction composition, and is representative of the claims on appeal:<sup>2</sup>

17. A method of reducing NO<sub>x</sub> emissions during fluid catalytic cracking of a hydrocarbon feedstock into lower molecular weight components said method comprising contacting a hydrocarbon feedstock with a cracking catalyst suitable for catalyzing the cracking of hydrocarbons at elevated temperature whereby lower molecular weight hydrocarbon components are formed in the presence of a NO<sub>x</sub> reduction composition, wherein said NO<sub>x</sub> reduction composition comprises a (i) mixed oxide of cerium and zirconium, (ii) optionally, at least one oxide from the lanthanide series other than cerium and (iii), an oxide of a transition metal selected from Groups Ib and IIb of the Periodic Table, said mixed oxide (i) is present in amounts of at least 70% by weight relative to the total of (i), (ii), and (iii) said NO<sub>x</sub> reduction component being present in a sufficient NO<sub>x</sub> reducing amount.

Appellants request review of the following grounds of rejection advanced on appeal by the Examiner: claims 17-23 and 25-29 under 35 U.S.C. § 103(a) over Peters (US 6,379,536 B1) in view of Aubert (US 6,214,306 B1); and claims 17-23 and 25-29 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of Kelkar (US 6,852,298 B2). Br. 4; Ans. 3 and 8.

Appellants argue the claims in each ground of rejection as a group. *See generally* Br. Thus, we decide this appeal based on claim 17. 37 C.F.R.

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<sup>2</sup> We have copied claim 17 as it stands of record in the Amendment filed August 30, 2007.

§ 41.37(c)(1)(vii) (2008).

### Opinion

#### I. § 103(a): Peters and Aubert

The Examiner finds that Peters describes an FCC process that differs from the claimed FCC process using the specified NO<sub>x</sub> reduction composition encompassed by claim 1 in that Peters' NO<sub>x</sub> reduction composition contains cerium oxide but does not contain a mixed oxide of cerium and zirconium. The Examiner finds that Peters discloses that other metal oxides having known oxygen storage capabilities can be used in addition to cerium oxide. Ans. 3-4, citing Peters col. 1, ll. 53-62, col. 2, ll. 51-53, col. 4, ll. 34-48, and col. 6, ll. 22-40. The Examiner finds that Aubert describes a solid solution of zirconium oxide and cerium oxide for NO<sub>x</sub> emissions reduction, and teaches the use thereof for this purpose in varied applications including, among other things, hydrodenitrification, cracking, and hydrocracking. The Examiner finds that Aubert describes zirconium oxide and cerium oxide as being important and advantageous in the so-called multifunctional catalysts for "three-way catalysts" used to treat exhaust gases from internal combustion engines. Ans. 4, citing Aubert col. 1, ll. 10-17 and 30-35, col. 2, ll. 47-57, col. 7, ll. 50-60. The Examiner concludes that one of ordinary skill in this art would have combined Peters and Aubert in view of the common objectives of NO<sub>x</sub> emissions reduction leading to the modification of Peters' process of cracking a hydrocarbon feed by including Aubert's solid solution of zirconium oxide and cerium oxide in Peters' NO<sub>x</sub> reduction composition to enhance NO<sub>x</sub> reduction capacity. Ans. 4-5.

Appellants submit the Examiner erred in finding that Peters and Aubert establish that Aubert's solid solution of zirconium oxide and cerium oxide are equivalent to Peters' cerium oxide and would have known advantages in removing NO<sub>x</sub> in Peters' process. Br. 4-5. Appellants contend Aubert "lists every catalytic process imaginable where ceria-zirconia can be used" to reduce NO<sub>x</sub>, and thus the Examiner has employed an "obvious to try" standard because "one of ordinary skill in the catalyst art would have no way of predicting how the mixed oxide would perform in any of the listed processes." Br. 5-6, citing Aubert col. 7, ll. 50-63. Appellants contend that Aubert does not disclose "that under the harsh FCC conditions, the ceria-zirconia solid solution will yield improved stability as found by Appellants relative to ceria alone." Br. 6; *see also* Br. 5. Appellants contend the data in Specification Table 1 shows "unexpected surface area retention ('SA retention %') and NO retention after catalyst steaming found using a mixed cerium-zirconium oxide" not suggested by the applied prior art. Br. 5; *see also* Br. 6. Appellants contend that the Examiner erred in finding that "the combined teachings of Peters and Aubert will inherently have all the claimed advantages shown in Table 1." Br. 6.

We cannot agree with Appellants' position. As the Examiner points out, the ground of rejection is not based on a finding that the combination of Peters and Aubert establishes that cerium oxide is equivalent to a solid solution of zirconium oxide and cerium oxide with respect to reduction of NO<sub>x</sub> emissions. Ans. 9 and 11. With respect to the issue of whether, on this record, one of ordinary skill in the art would have found it "obvious to try" Aubert's solid solution of zirconium oxide and cerium oxide in Peters' FCC

process based on Aubert's disclosure that the solid solution of oxides can be used in hydrodenitrification, cracking, and hydrocracking processes, Appellants have not established that this person would not have had a reasonable expectation of successfully reducing NO<sub>x</sub> emissions in Peters' process. Indeed, Appellants acknowledge and Peters teaches that NO<sub>x</sub> generation occurs in FCC processes and one of ordinary skill in the art would have found in Aubert's teachings the clear suggestion that the solid solution of zirconium oxide and cerium oxide reduces NO<sub>x</sub> in processes conducted in elevated temperatures, including hydrodenitrification, cracking, and hydrocracking. Spec., e.g., 1-2; Peters, e.g. col. 1, ll. 41-47, and col. 2, ll. 47-53; Aubert col. 7, ll. 50-63.

Thus, we determine that contrary to Appellants' position, one of ordinary skill in the art would have reasonably expected that Aubert's solid solution of oxides would successfully reduce NO<sub>x</sub> emissions in Peter's FCC processes. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) ("When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103."); *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1364 (Fed. Cir. 2007) ("the expectation of success need only be reasonable, not absolute"); *In re O'Farrell*, 853 F.2d 894, 903-04 (Fed. Cir. 1988) ("For

obviousness under § 103, all that is required is a reasonable expectation of success.” (citations omitted)).

Accordingly, on this record, as the Examiner has established, claim 1 is obvious over the combined teachings of Peters and Aubert. Indeed, all that claim 1 requires is that the FCC process specified therein achieves at least some reduction, however small, in NO<sub>x</sub> emissions. We are not persuaded of the nonobviousness of the claimed method encompassed by claim 1 by the evidence based on a comparison of FCC processes using cerium oxide alone and a mixed oxide of cerium and zirconium in Specification Table 1 which Appellants contend establishes unobvious results. *See above* p. 4.

We find that in Specification Table 1, the closest comparison which reflects the thrust of the rejection based on Peters and Aubert involves Example 1, “20% ceria – 80% zirconia,” and Comparative Examples A and B, “100% [ceria]” and “100% Zirconia.” The remaining Examples 4-7 are based on mixed oxides of ceria, zirconia, and 1-3 oxides from the lanthanide series. Spec. 8-10. The compositions were tested by hydrothermal laboratory deactivation by steaming at 1500°F for 4 hours. Spec. 10. “As can be seen, Examples 1 and 4 through 7 . . . yielded NO uptake retention and surface area stability relative to Comparative Examples A and B. The results of the testing are particularly unexpected in that zirconia oxide alone yielded little NO uptake of steamed materials.” Spec. 11.

We cannot agree with Appellants that the Examiner erred in finding that the evidence demonstrates a property inherent in the solid solution of zirconium oxide and cerium oxide used for NO<sub>x</sub> emissions reduction in an

FCC process in view of the teachings of Peters and Aubert. Ans. 9, 10, 11, and 12. As the Examiner points out, Aubert would have disclosed the use of the solid solution of zirconium oxide and cerium oxide in high temperature applications. Thus, on this record, the NO<sub>x</sub> emission reduction properties exhibited by the solid solution of zirconium oxide and cerium oxide at high temperatures such as in the tests conducted, would reasonably appear to have been expected by one of ordinary skill in the art to be those inherently possessed by the composition vis-à-vis cerium oxide alone and zirconium oxide alone from the teachings of Peters and Aubert. Indeed, Appellants have not shown that one of ordinary skill in this art would have considered the properties exhibited by the solid solution of zirconium oxide and cerium oxide to be unexpected.

Furthermore, we agree with the Examiner that the showing provided in Table 1 is not commensurate in scope with appealed claim 1 which requires only the presence of the specified NO<sub>x</sub> reduction composition in an FCC process, and does not specify a steam deactivation step. *Cf. e.g., In re Kulling*, 897 F.2d 1147, 1149-50 (Fed. Cir. 1990) (objective evidence directed to optional embodiments).

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Peters and Aubert with Appellants' countervailing evidence of and argument for nonobviousness and conclude, by a preponderance of the evidence and weight of argument, that the claimed invention encompassed by appealed claims 17-23 and 25-29 would have been obvious as a matter of law under 35 U.S.C. § 103(a).



II. obviousness-type double patenting: claims 1-9 of Kelkar

We agree with Appellants that the Examiner erred in disregarding the fact that the claimed method encompassed by Kelkar's patent claim 1 specifies an NO<sub>x</sub> reduction composition comprising, among other things, a specified ratio of cerium oxide to at least one oxide of a lanthanide series element other than ceria. App. Br. 7-8. Indeed, the Examiner has not established that it would have been within the ordinary skill in the art to modify Kelkar's claimed NO<sub>x</sub> reduction composition by replacing cerium oxide and the oxide of the lanthanide series element other than ceria, present in the specified ratio, with Aubert's solid solution of zirconium oxide and cerium oxide. Ans. 8 and 13-15.

Accordingly, we reverse this ground of rejection.

III

We have affirmed the ground of rejection of claims 17-23 and 25-29 under 35 U.S.C. § 103(a), and reversed the ground of rejection of the same claims under the judicially created doctrine of obviousness-type double patenting.

The Primary Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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